A. Cover S	<u>neet</u>						
1. Specify:	<ul><li>☐ agricultural project or</li><li>☑ urban project</li></ul>	<ul><li>☑ individual application or</li><li>☐ joint application</li></ul>					
2. Proposal title - concise but descriptive: Raw Water Facilities Improvement Program							
3. Principal a	pplicant - organization or affiliation	n: Contra Costa Water District					
4. Contact-na	nne, title:_ <u>Fred Simon, Senior En</u>	gineer					
5. Mailing add	dress:_Post Office Box H2O, Co	oncord, Ca 94524					
6. Telephone:	(925) 688-8125						
7. Fax:_(925) 688-8303							
8. E-mail: <u>fsi</u>	mon@ccwater.com						
9. Funds requ	uested-dollar amount: \$3,130,000						
10. Applicant	t cost share funds pledged-dollar	amount: \$12,512,800					
11. Duration-	(month/year to month/year):	8/01 toto					
	State Senatorial District No. 7, St	ongressional district(s) where the project is to be ate Assembly District No. 15, US Congressional					
Walnut Creek	x, Concord, Clyde, Pittsburg, Ant	project: The cities of Pacheco, Pleasant Hill, och and Oakley, California. For further details, r an illustration of the project's geographic					
declares the formula the truthful the individual applicants	ollowing: fulness of all representations in the dual signing the form is authorized;	g applicant. By signing below, the applicant e proposal; d to submit the application on behalf of the ms and conditions identified in Section 11 of this					
	Walter J. Bishop	02/15/2001					
(printe	ed name of applicant)	(date)					
(sig	nature of applicant)						

## B. Scope of Work

Relevance and Importance (B1, B2, and B3): The purpose of the Raw Water Facilities Improvement Program is to improve operational reliability of the District's raw water facilities, which are over 60 years old and nearing the end of their useful life. This project focuses on rehabilitating known canal system deficiencies in an effort to maintain current operation and improve water use efficiency and water quality. The project consists of such improvements as the repair of damaged concrete canal lining sections and the restoration of erosion damaged sites at various locations along the Contra Costa Canal, geotechnical and drainage improvements, levee repairs, and the installation of a one-way tide gate.

The Contra Costa Water District (CCWD) serves approximately 430,000 people throughout north, central, and east Contra Costa County, an urbanized region that is one of the fastest growing areas of the entire San Francisco Bay Region. CCWD sells raw water from the Contra Costa Canal (Canal) for municipal, industrial, landscape irrigation, and agricultural purposes. Its customers include 5 municipal customers, 10 major industries (including petroleum refineries and power generation facilities), 36 smaller industries, and approximately 50 agricultural users. CCWD operates raw water distribution facilities, water treatment plants, and treated water distribution facilities.

Following is a brief description of the projects of the Raw Water Facilities Improvement Program. A map showing the District's major facilities and location of the proposed projects is provided as Attachment 1.

I) Canal Lining Repairs - The 60-year old Canal is the District's only water conveyance facility for the entire region, delivering more than 100,000 acre-feet of water annually. The concrete lining of the Canal is weathered throughout its length and has been damaged through natural age and soil movement in numerous locations. Common deficiencies observed include cracks, erosion behind the canal lining, buckling, and material deterioration. One such site, repaired in January of 2001, was leaking water into a stormwater undercrossing at a rate of 125 gallons per minute.

The purpose of this project is to ensure the integrity of the Contra Costa Canal and consists of the repair of damaged concrete lining sections and the restoration of erosion damaged sites at various locations along the Canal. Rehabilitation of the damaged sections of the canal increases the reliability of CCWD's raw water conveyance system and reduces irrecoverable conveyance losses.

**II)** Canal Piping - Areas exist along the Canal where it is feasible to replace the existing Canal with a pipeline. The purpose of this project is to replace approximately 3,600 feet of canal with pipeline in areas where the lining has failed or is severely cracked. Installation of pipeline in these areas will reduce irrecoverable losses and provide both water efficiency and water quality benefits.

The new pipeline will rectify existing deficiencies in the canal lining, thereby reducing leakage and improving water use efficiency. Also, the pipeline will eliminate drainage inflow in these areas and will improve water quality.

# III) Levee Repairs

**Contra Costa Canal** - A four-mile-long unlined canal extends from the end of Rock Slough to Pumping Plant No. 1, where water is pumped into the Contra Costa Canal. The unlined canal is under tidal influence and flows through an area at the edge of the Delta, where mean surface elevation is at or below sea level. This portion of the canal does not have gates or flow control devices.

On the north, the canal crosses Hotchkiss Tract, with elevations from 0 to -5 feet below sea level, an area of the Delta surrounded on all sides by levees of varying height and reliability, including those that confine the Contra Costa Canal. Much of Hotchkiss Tract is farmland, including large dairy operations, but it has a substantial number of homes and businesses (marinas) around its periphery. Hotchkiss Tract also is crossed by the only road leading to Bethel Island, an island just to the north with 1,500 permanent residents.

If the levees along the Contra Costa Canal are breached, Hotchkiss Tract would flood, resulting in substantial contamination of the Contra Costa Canal from the dairy and agricultural activities on Hotchkiss Tract, and significant erosion damage for both the canal and the canal levee system from the high velocity flood flows. Flooding would also fully isolate 1,500 Bethel Island residents by inundation of Bethel Island Road. There would also be significant damage to properties and homes on Hotchkiss Tract.

The earthen levees that bound the Contra Costa Canal were built more than 60 years ago (1937) and are not rocked to resist erosion or seismic events. Spot repairs are made as needed. However, there has been no overall program to restore them to their original height and strength, although residential growth in the area has been substantial and is increasing.

During the El Nino storms of January 1998, severe and rapid wind driven erosion occurred in one section of the canal levee near Bethel Island Road. A fast emergency response by the Contra Costa Water District's O&M crews, with support from heavy equipment contractors, rock quarries and others, enabled the Water District to contain the erosion of an 150-foot section of the levee after 50 per cent of it had eroded away. The stopgap effort, carried out over a 24-hour period under severe storm conditions, contained the erosion before it blew through the full profile of the levee. Because of the lack of flow control devices, had the canal ruptured, flooding would have continued unabated until the low-lying areas were completely flooded to sea level elevation.

The 1998 occurrence defined the vulnerability of the canal levees. Since then the Water District has been engaged in increased surveillance and maintenance of the levees. The Water District recognizes the need to refurbish and strengthen the earthen levees along the Canal, to assure their stability in future storms. This activity will both protect the homes, businesses and lands

adjacent to the Canal, as well as protect the reliability of the Canal as a water supply for 430,000 residents of Central and Eastern Contra Costa County.

The project will involve stabilizing and reinforcing the levees and the lining of critical areas of the existing earthen canal with concrete. This will prevent water from eroding the levees and saturating the underlying soil and strengthen the canal.

**Mallard Slough -** Mallard Slough is a 3,000-foot long slough on the south side of the Sacramento River, between the city of Pittsburg and the unincorporated community of Bay Point. It is both a natural estuary and a secondary source of water supply for 430,000 people in central and eastern Contra Costa County. The Mallard Slough water supply is used to provide regional water supplies during the winter and spring months when water quality in the lower Sacramento-San Joaquin Delta is sufficiently good, that is, low in chlorides (salt). During the remainder of the year chlorides are too high to allow its use as a domestic and industrial water supply.

The Contra Costa Water District maintains a pumping station at the head of Mallard Slough, which it uses for several months in most years to provide an additional water supply for its customers. The water supply is pumped from Mallard Slough to the District's Bollman Water Treatment Plant in north Concord. Currently, the District is rebuilding the 40-year-old Mallard Slough pump station to provide increased reliability for its use as an annual water supply and for improved fire fighting flows that would be utilized after a major earthquake that disrupted other water supplies. The Mallard Slough pump station project is anticipated to cost the District \$10,000,000.

A significant deficiency at Mallard Slough unrelated to the District's reconstruction of the pump station is the vulnerability of the location to seasonal flooding. Mallard Slough is bounded by extremely old and deficient levees. As a result of the levee weakness, the slough periodically overflows into immediately adjacent wetlands in normal water years. However, the flood condition is increased during extremely high flood stages, which occur on the average once every 10 years. In those cases, the very high level of water in the Sacramento River backs up into Mallard Slough and threatens to overtop and/or fully breach the levees bonding Mallard Slough. Flooding in this condition threatens several hundred homes in northwestern Pittsburg and eastern Bay Point. In addition, it threatens the two parallel main lines of the principal rail lines into the San Francisco Bay Area, the Burlington Northern Santa Fe and the Union Pacific lines, which run through low marshlands abut 3,000 feet south of the Mallard Slough.

The project consists of reconstruction of approximately 500 feet of old deteriorated levee along the upper end of Mallard Slough to reduce the risk of flooding from the Sacramento River.

**IV)** Canal Closure/Modification - The 4.85-mile long Clayton Canal branches from the main Canal and formerly served raw water to areas in Southeastern Concord. Demand for raw water in this area has diminished and the Canal has been abandoned. This project involves the demolition of the concrete lining and importation of earthen backfill. Portions of the canal may be graded to direct drainage to the municipal storm drainage system. The abandonment ensures

canal safety and improves canal right-of-way drainage. The area will be hydroseeded to restore the canal to its natural setting.

The 5.17-mile long Ygnacio Canal branches from the main Canal at milepost 35.27 and rejoins the Canal at Milepost 37. This project may involve the demolition of the concrete lining and importation of earthen backfill as necessary or the canal right-of-way could be modified to provide drainage and open space solution for the municipal area. Portions of the canal may be graded to direct drainage to the municipal storm drainage system. The area will be hydroseeded to restore the canal to its natural setting as necessary. This project scope is still under development and may consist of a variety of alternatives from rehabilitation, abandonment, or modified usage. Any alternative improves canal efficiency by eliminating significant water loss through leakage, and isolation of current natural drainage from the canal drinking water source.

- V) Road/Drainage Repairs Canal roads run parallel to the Canal and are used daily by the Canal water tenders and the Canal Safety Officers. Canal roads also provide access to all locations along the Canal for maintenance and repairs. There are sections of the roads that direct drainage into the canal. This project involves the paving and grading of approximately 10 miles of canal road to mitigate drainage inflow into the canal. Drainage mitigation will improve water quality.
- VI) Cypress Tide Gate CCWD has historically experienced a rise in chloride levels in the earthen intake channel of the Contra Costa Canal when pumping is stopped at Rock Slough. From previous studies, it is believed that the cause of the rise in chloride levels may be due to groundwater seepage into the canal during low tide periods, and when Rock Slough Pumps are not operating. Since CCWD now operates the Old River intake more frequently, the use of Rock Slough has decreased, and high chloride levels have become a greater concern.

This project involves the installation of a one way tide gate in the intake channel to mitigate low water level conditions in the Canal and to improve Canal water quality.

## Technical/Scientific Merit, Feasibility, Monitoring, and Assessment (B4, B5, and B6)

This section provides information on the methods and procedures that will be used to achieve the project goals and objectives. The monitoring and assessment of projects will be conducted using the District's current project benchmarking and project management procedures, which include:

- Monthly Financial Reports, distributed each month after the month-end close to provide managers with timely financial performance data
- Master Project Schedule, which is updated bi-weekly in order to provide project schedule status on all capital projects in Construction and Design.
- Master Project Authorization, tracking system which ensures that all capital projects have Senior Management project scope and budget review and approval prior to commencing project design.

Following is a description of the approach for each project. A bar chart schedule with tasks and expected quarterly expenditures is provided as Attachment 2.

I) Canal Lining Repairs - Because raw water is used for industrial and municipal customers downstream, the canal must deliver water 24 hours per day. To do the work while keeping the canal in operation, temporary cofferdams with bypass pumping must be used. Pumps would be used to divert the flow around the sections to be repaired. In order to isolate the sections of the canal for lining replacement and crack repairs, temporary cofferdams must be used. The area between the cofferdams is dewatered for construction and shotcrete work. Cofferdams will be used at least two lining panels (30 feet) in front of and behind the proposed replacement or repair areas.

Research identified a modular type cofferdam for its greater availability, reliability, stability and ease of reuse. The cofferdam is constructed by stacking one cubic yard (3' by 3') modular cubes filled with sand in a triple wall 6 feet high. The weight of the cubes and interlocking construction makes the cofferdam naturally stable as a gravity dam. The modular dam will also allow for a diversion tube through the wall for emergency flow without pumping.

After the designated section of the canal is dewatered, damaged canal lining panels are demolished and removed. The underlying earth is repaired as needed and the panels are replaced using shotcrete and rebar. The District has used this procedure to repair damaged sections of the canal at 5 other locations.

II) Canal Piping - There are segments of the Canal Loop in which the open canal can be replaced with a closed pipeline. This will reduce water losses by replacing the deteriorated lining and will improve water quality by eliminating drainage inflow. Repairs can be made when the Loop is out of service, therefore there is no need to provide bypass pumping. The project involves demolition of the existing lining, installation of HDPE pipeline and concrete headwalls, slurry backfill and steel reinforcement. Additional drainage system will be constructed to redirect runoff that currently enters the Canal.

#### III) Levee Repair

Contra Costa Canal - Several methods have been identified to be suitable for addressing the issues of static stability of the levees and seismic deformations at the site. These include excavating and replacing potentially liquifiable materials, adding rip-rap to the interior slopes of the canal, flattening the upper slopes of the canal, or compacting liquifiable materials using vibratory probe techniques.

The first phase of this project will be a geotechnical evaluation to identify the best method to stabilize the levees. The second phase of the project will involve strengthening of the levee and lining of a critical section of the channel. Repair and strengthening of the earthen levees and lining critical portions of the channel (approximately 5,000 feet) with reinforced concrete is projected to cost \$4.3 million. This includes geotechnical reports, engineering, environmental documentation, and construction administration.

**Mallard Slough Flood Mitigation** - The project consists of reconstruction of 500+ feet of old, deteriorated levee along the upper end of Mallard Slough to reduce the risk of flooding from the

Sacramento River into the affected areas. The levee to be reconstructed and strengthened is in the vicinity of the pump station that is being rebuilt by the Water District and would afford additional protection for that facility as well. A significant portion of the project would include levee improvements to reduce flood risk to the pump station and reduce the flood potential in the vicinity of the pump station. This work would include soil pre-loading and levee reconstruction using native and imported material.

Repair and strengthening of the Mallard Slough levee is projected to cost \$2 million. This includes geotechnical reports, engineering, environmental documentation, and construction administration.

**IV**) Canal Closure/Modification - The abandoned Clayton Canal serves to collect stormwater runoff. Negotiations with local agencies are scheduled to discuss connecting the abandoned canal with municipal storm drainage systems. This project involves the demolition of the canal and restoration of the area to its natural setting. Portions of the canal in Concord area may be incorporated in the municipal drainage system.

In the Concord Naval Weapons Station Area, the canal lining bottom will be punched using hydraulic equipment every 15 feet of canal length. The sides of the canal will be pushed in the canal and backfill will be imported as needed. The area will be hydroseeded as necessary to restore it to its natural habitat.

In the Concord Area, the canal lining will be demolished and the corridor may be converted to a natural swale to convey stormwater from the area. The use of the Clayton canal for drainage is scheduled to be negotiated with local agencies.

V) Road/Drainage Repairs - This project involves the repair and regrading of approximately 10 miles of the 48-mile canal road. Sections of the road that direct drainage into the canal will be regraded and resurfaced. Deteriorated sections of the road will also be repaired to mitigate water quality impacts.

Repairs will consist of the import of aggregate base, grading of the road to direct drainage away from the Canal, compaction, and paving.

VI) Cypress Tide Gate - This project involves the installation of a one-way tide gate to maintain water levels in the unlined portion of the canal during low tides. Two prefabricated concrete boxes would be installed in the Cypress Road undercrossing. Each box will contain flap gates that will close during low tide, maintaining water levels in the unlined portion of the canal. This will prevent groundwater from seeping into the canal during low tide.

The District can switch to the Old River/Los Vaqueros supply, allowing for the dewatering of the unlined portion of the canal without interruption of service and without bypass pumping. A temporary dam in the canal upstream of Cypress Road and the utilization of Pumping Plant No. 1 will allow for dewatering of this section.

# C. Outreach, Community Involvement, and Information Transfer (C1, C2, C3, and C4)

This section describes outreach efforts that will be made by the Contra Costa Water District during the Raw Water Facilities Improvement Program.

The Raw Water Facilities Improvement Program will enable the District to reliably meet increasing customer demands for water, and ensure that 430,000 individuals in Contra Costa County benefit from superior water quality and reliability. Public outreach is an essential part of this project. In order to keep our customers informed, contact will be made through various means including the publication of the District newsletter, ON TAP, which is printed and circulated to 136,000 households and businesses 3 times a year. Bill inserts will provide information to approximately 58,000 account holders twice a year. Messages on the back of bills are mailed out 6 times a year. Additionally, information will be made available through various District publications (i.e. the Annual Report, press releases, etc.) and on our web site (www.ccwater.com).

The District's efforts in disseminating project information to the 430,000 individuals in the service area will encompass the following:

Educational materials – Fact sheets about the project and CALFED's efforts to improve the Bay-Delta ecosystem and provide a reliable supply of water for the state will be critical to successful public education. Project progress will be highlighted in regular newsletters. Customers will receive direct information through utility bill inserts, and other mediums.

*Media relations* – Public service announcements and editorial commentary in print and on electronic media are very effective and reach a large, diverse audience.

Web site – The District's web site will keep the community updated on project progress, how the project benefits the County, and provide a contact phone numbers for customer questions.

Community event participation – Participation in community events such as fairs and festivals are highly visible opportunities to inform local residents. A simple exhibit with display boards, water-related props, promotional items, information pamphlets, and an interactive component will be an attractive educational tool for the District.

# D. Qualifications of the Applicants, Cooperators, and Establishment of Partnerships (D1, D2, and D3)

The responsibility for these projects will be assigned to Stephen Welch, Project Manager and Fred Simon, Project Engineer. Their resumes are provided as Attachment 3.

## E. Costs and Benefits

Budget Summary, Breakdown, and Justification (E1, E2) - This section provides a summary breakdown of the Raw Water Facilities Improvement Program Costs for the next three years.

The total cost to fund this program through fiscal years '02, '03, and '04 is \$15.7 million which includes design, construction, and administration costs. As all the Raw Water Facilities Improvement Projects described herein reduce irrecoverable water losses or improve water quality, the District requests a Water Use Efficiency Grant of \$3.1 million (20% of the total project costs). Construction costs include sales tax and construction overhead and profit. Construction costs are estimated from recent contract bid prices for similar construction projects.

Project Administration is justified as follows: Staff will include one Senior Engineer at a rate of \$85,000 per year and two Associate Engineers (one from the Engineering Department and one from Construction Department) at a rate of \$76,000 per year. The benefit rate established for these positions is 28.2%. \$3,538 is required for operating supplies to complete this project. \$105,000 is required to hire a Construction Management Consultant. \$2,200 is requested for travel of project staff members to and from the project site, as well as to various project-related meetings.

A detailed budget is provided as Attachment 4. The table breaks out the costs for each of the six (6) projects requesting funding for the Raw Water Facilities Improvement Program.

**Project Outcomes and Benefits (E3)** - This section lists expected project outcomes (the physical changes that will occur as a result of the project) and expected benefits (the value of those outcomes). This section will also identify how each outcome and benefit will be shared among the project's beneficiaries. Projects will focus on achieving three key benefits or goals:

- 1. Reducing irrecoverable water losses
- 2. Improving water quality
- 3. Attaining environmental or ecosystem benefits

**Canal Lining Repairs:** Repairing or replacing damaged canal lining sections significantly reduces irrecoverable water losses to seepage (exfiltration). In addition, repaired canal lining sections improve ecosystem quality in areas where public recreational activities are present, such as the East Bay Regional Park District trail system. Trail users enjoy having a scenic recreational corridor that provides a habitat for birds and vegetation.

Unaccounted for Water (UAW) is a significant portion of the total inflow pumped into the canal system. Losses from the canal could include under-registered raw water use, evaporation and exfiltration, with the latter making up the greatest UAW percentage. Average annual UAW for the District's raw water conveyance facilities over the period 1993 through 1999 was approximately 7,500 acre-feet. Reduction of the irrecoverable portion of these losses will benefit both CCWD and all users of the Delta system, as well as the Delta environment.

This project offers shared quantitative and qualitative benefits for both CALFED and the District. Reductions in water loss directly translate to both resource and cost savings. In addition, reduction of irrecoverable losses will reduce the quantity of water that will need to be conveyed by District pumping facilities, providing long-term energy savings.

**Canal Piping:** In certain areas where possible seepage into adjacent private property creates a significant liability, the District has exercised the option to replace portions of the canal with buried sections of pipe. These piped sections of the canal greatly reduce seepage losses locally and reduce canal maintenance costs. While localized seepage losses are small, they are cumulative and will reduce irrecoverable losses overall.

Canal piping has also been explored as a replacement for the smaller, 5.18-mile long Ygnacio Loop. This smaller canal creates a peripheral loop from the main canal and serves suburban residential areas by providing a raw water source and recreational corridor. Deterioration of this system is attributed to age, the original materials used (asphalt "test sections" in many areas), and adjacent development. To prevent significant irrecoverable seepage losses and potential liability costs, the District replaced portions of the Ygnacio Canal with buried pipe in 1996.

Piped portions of the canal also serve to prevent impurities in storm or drainage runoff from entering into the canal. Storm runoff from golf courses, homes, city streets and open space is captured and redirected instead to the municipal storm drainage system.

In addition, piped canal sections improve public safety and aesthetic value in more densely populated urban areas by allowing portions of the canal right-of-way to return to a more natural open space setting. All these benefits are demonstrated with a recently piped portion of the canal near Lime Ridge in Concord.

This project offers shared quantitative and qualitative benefits for both CALFED and the District. Even modest reductions in water loss translate to both resource and cost savings. In addition, this project provides improved water and ecosystem quality. In addition, reduction of irrecoverable losses will reduce the quantity of water that will need to be conveyed by District pumping facilities, providing long-term energy savings.

**Levee Repairs:** Maintaining levee system integrity at Rock Slough and Mallard Slough are an important factor in preserving water quality and water supply for the District. The Contra Costa Canal system intake includes approximately four miles of earthen unlined levees near Antioch and Oakley. These levees were last improved in 1991 and emergency repairs performed during the El Nino storms of 1998. Repairs to the earthen levees reduce seepage losses locally, reduced accumulation of sediment in the main canal system, and reduced canal cleaning and maintenance costs. In addition, properly maintained levees prevent flooding of rural low lands.

More importantly, the earthen levees prevent contaminants from agricultural sources from entering into the canal (infiltration). The levees run through mostly agricultural rural land. With numerous farms and dairies, contaminants from pesticides, animal waste, and other agricultural activities could cause serious water quality damage if the levees were improperly maintained or breached. With the proposed levee repairs, these possible contaminants are prevented from entering into the canal system.

This project offers shared quantitative and qualitative benefits for both CALFED and the District. Elimination of exfiltration as well as infiltration from agricultural sources maintains water supply and ecosystem quality.

Canal Closure/Modification: The District's 4.85 mile long Clayton Canal once served an area similar to that currently served by the Ygnacio Canal. Branching from the main canal, the area served by the Clayton Canal became increasingly urbanized and was not utilized as a recreational corridor. Demand for raw water from this canal diminished and it was eventually abandoned. Today, it generally serves to collect storm runoff, although it has not been officially accepted into the municipal storm drainage system.

Elimination of the Clayton Canal will also prevent the collection of storm or drainage runoff in a facility not designed for such. Storm runoff from golf courses, homes, city streets, and open space will instead be redirected to the municipal storm drainage system.

In addition, elimination of the Clayton Canal will improve public safety and aesthetic value in more densely populated urban areas by allowing portions of the canal right-of-way to be utilized by the City or adjacent private property.

This project will offer shared quantitative and qualitative benefits for both CALFED and the District. In addition, this project provides improved ecosystem quality. The District benefits from reduced maintenance costs.

Canal Road Repairs: The canal road system is an important factor in preserving water quality and water supply. The canal roads are designed to slope away from the canal, thereby preventing contaminants from storm runoff from entering the raw water system. Along certain areas of the canal, the roads have deteriorated. With agricultural lands adjacent to the canal, contaminants from pesticides and animal waste could cause significant water quality damage. Proper maintenance and upgrades to the canal roads will prevent possible contaminants from entering into the canal system.

This project offers shared quantitative and qualitative benefits for both CALFED and the District. Elimination of contaminated runoff maintains water supply and ecosystem quality.

Cypress Tide Gates: The proposed Cypress tide gates will be an important factor in preserving water quality and water supply for the District. More importantly, the Cypress tide gates will prevent contaminants from agricultural sources from entering into the canal (infiltration) during low tides. With numerous farms and dairies, contaminants from pesticides, animal waste, and other agricultural activities could cause serious water quality damage. These tide gates will prevent possible contaminants from entering into the canal intake system.

This project will offer shared quantitative and qualitative benefits for both CALFED and the District. Elimination of exfiltration as well as infiltration from agricultural sources maintains water supply and ecosystem quality. It benefits both CCWD as well as CALFED agencies in that improved water quality at the locations helps CALFED in meeting water quality goals at reduced water costs.

**Assessment of Costs and Benefits (E4) -** This section provides an assessment of the costs and benefits of the proposed Raw Water Facilities Improvement Program. Table 1 provides a summary of the project costs, quantitative and non-quantitative benefits, and project specific assumptions. The following general assumptions were used to calculate the present value of the estimated benefits.

- 1. Value of water \$100/acre-foot
- 2. Six percent discount rate
- 3. Life of 25 years

**Table 1 - Assessment of Costs and Benefits** 

		Quantitative	Non-Quantitative	
Project	Costs	Benefits	Benefits	Assumptions
Canal Lining	\$5,428,629	\$1,469,349	1. Reliability,	4 sites/yr over 3 years,
Replacement		(water loss)	2. Reduction in damage	leakage of 50 gpm per site
			claims	
			3. Improvement and	
			preservation of	
			ecosystem	
Canal Piping	\$611,820	\$148,461	1. Reliability,	leakage rate of 20 gpm per
		(water loss)	2. Water quality,	1000 ft of deteriorated
			3. Reduction in damage	lining
			claims	
			4. Improvement and	
			preservation of	
			ecosystem	
Levee Repairs	\$5,380,000		1. Water quality,	
			2. Flood control,	
			3. Levee stability	
Canal	\$553,101		1. Flood control,	100,000/yr avoided
Closure/Modification		(water loss)	2. Ecosystem	maintenance. Water losses
		\$1,278,336	rehabilitation	of 500 AF/yr (20 gpm per
		(maintenance)		1000 ft of lining)
Road/Drainage	\$1,320,000		1. Water Quality	
Repairs				
Cypress Tide Gate	\$250,000		1. Water Quality	

Each project identified in the Raw Water Facility Improvement Program serves to meet the overall CALFED goal to ensure that California's water supplies are used efficiently and achieve multiple benefits. Projects that reduce irrecoverable water losses will reduce CCWD's overall water demand, increasing the supply available for the State Water Project, Central Valley Project, and other Delta water users. A decrease in overall demand will also reduce the District's use of energy, providing long term energy conservation benefits. Other projects identified in the Raw Water Facilities Improvement Program serve to meet other CALFED objectives of water quality, water supply, and levee stability.